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SXAS and SXES Studies of Monodisperse Chromium(III) Oxides Mesoparticulate Thin Film

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Introduction: For a fundamental understanding of the nano-materials, which is essential for tailoring the properties, it is important know electronic structure of such materials. Here, we report a near edge x-ray absorption studies of chromium(III) oxide nano-particles[1].

Methods and Materials: Soft x-ray originates from an electron transition between a localized core state and a valence state. The most striking features of x-ray spectroscopic characterization are (1) the atomic and site selectivity due to transitions involving core levels, and (2) the orbital and symmetry selectivity by virtue of dipole selection rules and the use of polarized x-rays from synchrotron radiation sources. We are reporting here on the inexpensive fabrication of large arrays of chromium(III) oxide (eskolaite) with well-defined monodisperse spherical mesoparticles (250 nm) grown directly onto single crystalline silicon wafers (Si or SiO_2) or polycrystalline (transparent) TCO substrates, from the condensation of a chromium salt in aqueous solution at low temperature. Subsequently, the thin films are heat treated at 500˚C for one hour to obtain the stoichiometric and thermodynamically stable corundum phase of green Cr(III) oxide, i.e. eskolaite (alpha-Cr_2O_3).

Results: The SXAS and SXES studies reveal the electronic structure of such materials prepared under various conditions. Figure 1 shows a broadening of Cr *2p* absorption under a heated treatment of chromium(III) oxide nano-particles.

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References: [1] L.Vayssieres, J. Guo, and J. Nordgren, to be published.

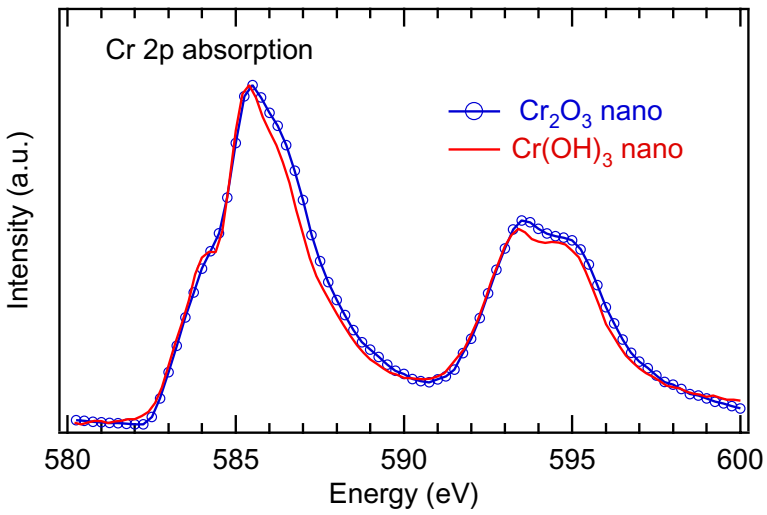

Figure 1. Cr 2p absorption spectra of chromium(III) oxide nano-particles.